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(FILE 'HOME' ENTERED AT 16:18:35 ON 19 MAR 2003)

FILE 'CA' ENTERED AT 16:18:45 ON 19 MAR 2003

L1 145106 S TITRAT?  
L2 3313 S L1 AND FLOW?  
L3 3447 S L1 AND (AUTOMAT? OR(COMPUTER OR PROCESS!R) (3A) CONTROL)  
L4 330 S L2 AND L3  
L5 25 S L3 AND(FEEDBACK OR FEED BACK)  
L6 1111 S L1 (2A) CONTINU?  
L7 126 S L2 AND L6  
L8 42 S L7 AND CONTROL?  
L9 75 S L1 (4A) GRADIENT?  
L10 10 S L9 AND CONTROL?  
L11 66 S L7,L9 AND AUTOMAT?  
L12 105 S L1 AND(FEEDBACK OR FEED BACK)  
L13 57 S L12 AND(FEEDBACK OR FEED BACK OR TITRAT?) /TI, IT, ST  
L14 146 S L5,L8,L10-11,L13

=> d l14 bib,ab 1-146

L14 ANSWER 16 OF 146 CA COPYRIGHT 2003 ACS

AN 132:216179 CA

TI Triangle-Programmed Coulometric Nanotitrations Completed by Continuous Flow with Potentiometric Detection

AU Guenat, Olivier T.; Van der Schoot, Bart H.; Morf, Werner E.; De Rooij, Nicolaas F.

CS SAMLAB Institute of Microtechnology, University of Neuchatel, Neuchatel, CH-2007, Switz.

SO Analytical Chemistry (2000), 72(7), 1585-1590

AB Coulometric nanotitrations were realized in a microchannel system using a continuous-flow titrn. technique with a triangle current-time profile.

Redox and acid-base titrns. were carried out on Fe(II) and nitric acid samples, resp., with the same nanotitrator device. A linear relation between the concn. and the coulometric current transferred to the soln. was found. The advantages of this universally applicable nanotitrator are fast response, low sample vol., high sensitivity, and high reproducibility as well as the convenience of handling an automated analyzer of the flow-through type.

L14 ANSWER 17 OF 146 CA COPYRIGHT 2003 ACS

AN 132:175008 CA

TI Coulometric microflow titrations with chemiluminescent and amperometric detection of the equivalence points - basic investigations and bromimetric titration of low concentration solutions of arsenite

AU He, Z. K.; Fuhrmann, B.; Spohn, U.

CS Institute of Biotechnology, Martin-Luther-Universitat Halle-Wittenberg, University of Halle, Halle, D-06120, Germany

SO Analytica Chimica Acta (2000), 407(1-2), 203-212

AB Coulometric flow titrns. were combined with chemiluminescent detection of the equivalence points. The flow channel system consists of a miniaturized flow electrolytic cell, a knotted type tubular reactor and a capillary wall-jet chemiluminescence detector with an outer tube for the addn. of luminol reagent soln. The chemiluminescence detector can be used to det. bromine in the range between 0.1  $\mu$ M and 1 mM opening up a sensitive way to follow flow titrns. with linear concn. gradients of bromine. Very low concns. of arsenite can be titrated in a sample flow channel system with electrogenerated bromine. The chemiluminescence detection was compared

with the amperometric monitoring of the titrn. curves. To perform such **gradient controlled** flow titrns. without calibration, it was necessary to minimize the so-called tailing. At gradient generation times  $\geq 120$  s, arsenite can be titrated almost without calibration at 0.05-100  $\mu\text{M}$ . The accessible detn. range is detd. by the max. electrolysis current and the sample flow rate. Added micromolar concns. of arsenite were accurately detd. in river water and phosphate solns.

L14 ANSWER 18 OF 146 CA COPYRIGHT 2003 ACS  
AN 132:63324 CA  
TI An **automated** flow-injection titrator for spectrophotometric determinations of total acidity in wines, using a single standard solution and gradient calibration  
AU Gaiao, Edvaldo N.; Honorato, Ricardo S.; Santos, Sergio R. B.; Araujo, Mario Cesar U.  
CS Dep. Quim., Universidade Federal da Paraiba, Joao Pessoa, CEP 58051-970, Brazil  
SO Analyst (Cambridge, United Kingdom) (1999), 124(11), 1727-1730  
AB An **automated** flow-injection titrator to perform spectrophotometric detns. of acidity in wine samples is described. The proposed **titrator** exploits concn. **gradients** generated in the flow-injection system and, in contrast to the **automated** flow titrators previously proposed, it does not require anal. curves based on several std. solns. of tartaric acid. Only one single std. soln., the proper titrant, is directly used for gradient calibration and calcg. of the analyte concns. A simple lab.-made photometer that uses an LED (Light-Emitting Diode) as light source and a phototransistor as detector was built in to this titrator. Yellow LED was usually used for spectrophotometric measurements because m-cresol purple ( $7.4 < \text{pH} < 9.0$  yellow-purple transition) was selected as acid-base indicator. The system is fully **controlled** by microcomputer and the software for **control** and for acquisition and treatment data was written in C language. A good agreement between results yielded by the proposed titrator and those produced by a ref. method of the Assocn. of Official Anal. Chem. (AOAC) was obtained and no statistical difference between results at the 95% probability level was confirmed by applying the paired t-test. An overall relative accuracy of ~0.9% and a mean relative std. deviation  $< 1.5\%$  were obtained with nine replicate titrns. The proposed titrator allows 72 detns. per h to be carried out, consuming just 200  $\mu\text{L}$  of the sample and 1.5 mL of the titrant.

L14 ANSWER 20 OF 146 CA COPYRIGHT 2003 ACS  
AN 131:280657 CA  
TI Analytical options for **control** of acids and bases in hydrometallurgical processes  
AU Albertus, Fernando; Cortes, Isel; Danielsson, Lars-Goran; Ingman, Folke  
CS Department of Chemistry, University of Balear Islands, Palma de Mallorca, 07071, Spain  
SO Process Control and Quality (1999), 11(4), 289-300  
AB The most common procedures for the detn. of acids and bases in hydrometallurgical process liquors are reviewed and compared. **Automated** batch titrns., performed by stepwise addn. of titrant and using Gran plots for evaluation are reliable but slow compared to **flow** techniques. **Continuous flow titrns.** are grouped into three classes: **Flow** Injection Titrn., Single Point **Flow** Injection Titrn., and Triangle-programmed **Flow** Titrns. Furthermore, Sequential Injection Anal. is also considered for process applications. Each one of these methods has advantages and drawbacks. An overview of the most common application problems, and the way they are solved with each methodol., is given. The anal. characteristics of the described procedures are given as well as a guide

for the choice of technique for a given application.

L14 ANSWER 21 OF 146 CA COPYRIGHT 2003 ACS  
AN 131:230340 CA  
TI A robust multisyringe system for process **flow** analysis. Part I. On-line dilution and single point **titration** of protolytes  
AU Albertus, Fernando; Horstkotte, Burkhard; Cladera, Andreu; Cerdà, Victor  
CS Department of Chemistry, University of the Balearic Islands, Palma de Mallorca, 07071, Spain  
SO Analyst (Cambridge, United Kingdom) (1999), 124(9), 1373-1381  
AB A robust multichannel manifold involving a multisyringe piston pump used for performing process **flow** anal. is proposed. The simultaneous sequential detn. of two analytes with a sampling frequency of 97 injections per h is demonstrated. A robust and rapid **continuous flow titrn.** system, including a pre-diln. step, was developed. A quant. diln., avoiding the need for dilg. the stds. too, is achieved in two steps by 1st splitting the concd. sample stream and further diln. in a mixing chamber. A wide range of diln. grades (from 80 to 1150) can be easily implemented by software instructions, without the necessity of mech. reconfiguration of the manifold. The resulting system gives medium or low dispersion peak signals with a sampling frequency of over 75 injections per h for off-line dild. samples, and >33 injections per h for concd. samples. The proposed assemblage allows the **automation** of the single point **flow injection titrn.** procedure for the assay of acids and bases in concd. process solns. Recoveries of 97.5-103% were found with a max. relative std. deviation value of 5%.

L14 ANSWER 26 OF 146 CA COPYRIGHT 2003 ACS  
AN 128:196363 CA  
TI Pulsed **flow** chemistry. A new approach to the generation of concentration profiles in **flow** analysis  
AU Wang, Xue D.; Cardwell, Terence J.; Cattrall, Robert W.; Jenkins, Graeme E.  
CS School of Chemistry, Centre for Scientific Instrumentation, La Trobe University, Melbourne, 3083, Australia  
SO Analytical Communications (1998), 35(3), 97-101  
AB Pulsed **flow** chem. (PFC) is described as a new approach to **automated** online anal. chem. In contrast to existing **flow-based** anal. chem. methods, PFC is characterized by pulsed **flow**, turbulent mixing and low axial dispersion. The PFC system is fully computerized and all operations are under software control. Consequently, most **flow** anal. methods (e.g., **flow injection**, **continuous flow**, **flow titrn.**, etc.) can be selected with a simple click of the mouse. The system is easily miniaturized and portable which makes it particularly suited to field instrumentation. The system has been tested using several **flow-based** techniques including **online titrn.** for the detn. of calcium in waters with potentiometric detection and a calcium ion sensor.

L14 ANSWER 27 OF 146 CA COPYRIGHT 2003 ACS  
AN 128:18220 CA  
TI Single standard calibration and data processing in **flow injection titration** based on concentration **gradients**  
AU Araujo, M. C. U.; Santos, A. V.; Honorato, R. S.; Pasquini, C.  
CS Departamento de Química, CCEN, Universidade Federal da Paraíba, Toá Pessoa, 58051-970, Brazil  
SO Journal of Automatic Chemistry (1997), 19(5), 157-164  
AB This paper describes use of gradients of concn. generated in **flow injection** (FI) systems to perform detns. based on points where the concn. of titrant and analyte are at stoichiometric ratio. Two procedures were developed.

In one procedure the titrant is injected in a FI manifold and merges with the sample which is continuously pumped towards the detector. In the other procedure the sample is injected and merged with the titrant which is continuously pumped. Both techniques make use of concn. gradients of the sample or titrant generated in FI manifolds that contain a mixing chamber. This gradient is calibrated employing only one std. soln. (usually the titrant) to convert any detector signal, obtained in the elapsed time after injection, to instantaneous concn. values. The flow system is microcomputer controlled and data are treated to locate points where the concn. of titrant and analyte are at the stoichiometric ratio. These points are found in abrupt changes of the signal  $\times$  concn. curves obtained in the presence of the reaction. The method was evaluated for detn. of Fe(II) and acetic acid by spectrophotometric and conductimetric detection, resp. Results show a mean relative std. deviation <1%, an av. accuracy of 1% and a high sampling processing capability (40 to 60 samples per h).

L14 ANSWER 33 OF 146 CA COPYRIGHT 2003 ACS

AN 123:131296 CA

TI Linear flow gradients for automatic titrations

AU Lopez Garcia, I.; Vinas, P.; Campillo, N.; Hernandez Cordoba, M.

CS Department of Analytical Chemistry, Faculty of Chemistry, University of Murcia, Murcia, E-30071, Spain

SO Analytica Chimica Acta (1995), 308(1-3), 67-76

AB A manifold to perform **automatic continuous flow titrns.** is presented. The system is based on the use of a variable-speed peristaltic pump which delivers the titrant at a linearly increasing **flow rate** and another pump working at a const. and higher speed, placed after the detector, the difference between both **flow rates** being compensated by the aspiration of the titrant through a T-piece. A soln. contg. the indicator is also propelled by the fixed speed pump. With such an arrangement, the **flow rate** through the spectrophotometric cell is const. and there is no drift of the baseline. The equations describing the behavior of such a system are 1st obtained and then exptl. checked by using both acid-base and complexometric **titrns.** The approach is highly reproducible (relative std. deviations (relative std. deviation) below  $\pm 1.5\%$ ), but inaccurate, since the time necessary to reach the equivalence point is longer than that predicted by theory. To avoid the need of a previous calibration, a 2nd gradient can be performed by decreasing the variable-pump speed to zero. In this way, two equivalence points are obtained. Since both gradients are diametrically opposite, the difference in time between the two equivalence points agrees with that predicted by theory, as the errors can only cancel each other out. For acid-base and complexometric **titrns.** the errors are below  $\pm 2\%$ .

L14 ANSWER 38 OF 146 CA COPYRIGHT 2003 ACS

AN 121:194500 CA

TI Flow injection titration - linear or logarithmic

AU Chen, R.; Ruzicka, J.; Christian, G. D.

CS Cent. Process Anal. Chem., Univ. Washington, Seattle, WA, 98195, USA

SO Talanta (1994), 41(6), 949-55

AB A simple and rapid **Continuous Flow Injection Titrn.** method utilizing a pretitration step was developed to **automatize** the assay of high sulfuric acid concns. over a narrow range in an oil refinery stream. A Coulometric **Flow Injection Titrn.** method was developed to perform Karl Fisher **titrn.** Multiple functions of the mixing chamber in these FIA **titrns.** such as for pretitration diln., and redn. of viscosity are discussed. The cell also serves as the detector. Appropriate combining of these functions allows FIA **titrns.** to become a powerful tool in **automating** routine assays.

LM4 ANSWER 39 OF 146 CA COPYRIGHT 2003 ACS  
AN 121:25682 CA  
TI A PC-based titrator for flow gradient titrations  
AU Fuhrmann, B.; Spohn, U.  
CS Inst. Biotechnol., Martin-Luther-Univ. Halle-Wittenberg, Halle/Saale,  
06120, Germany  
SO Journal of Automatic Chemistry (1993), 15(6), 209-16  
AB This paper describes a PC (personal computer) based titrator which was developed for gradient flow titrns. Concn. gradients were generated electrolytically or volumetrically in small tubes. Complete titrn. curves can be recorded online and evaluated automatically. The titrator can be used with all liq. flow detectors with low axial dispersion. The titrator was evaluated for the titrn. of thiosulfate with electrogenerated triiodide and for the titrn. of NH<sub>3</sub> with electrogenerated hypobromite after continuous gas dialytic sepn. of NH<sub>3</sub> from the sample soln.

LM4 ANSWER 40 OF 146 CA COPYRIGHT 2003 ACS  
AN 120:235172 CA  
TI Monitoring and controlling metalworking fluid  
IN Becket, Giles J. P.  
PA Cincinnati Milacron Inc., USA  
SO PCT Int. Appl., 41 pp.  
PI WO 9324831 A1 19931209 WO 1993-US5204 19930601  
US 5389546 A 19950214 US 1994-230445 19940420  
PRAI US 1992-891118 19920601  
AB The total alky. of an aq. metalworking fluid is monitored and controlled by a continuous titrn. method that continuously supplies a stream of the metalworking fluid, at a known, controllable flow rate, to a flow-through chamber contg. a static mixing element. Simultaneously and sep., a stream of acid titrant of known acid concn. is injected into the flow-through chamber at a known controllable flow rate. The acid titrant and metalworking fluid mix and react in the chamber, and the reacted metalworking fluid exiting the chamber passes over the tip of a pH electrode. The pH of the reacted metalworking fluid is continuously monitored and the output of the pH electrode used to adjust the flow of acid titrant to the chamber until an endpoint pH value (typically 4) is reached. The total alky. is then detd. from the known flow rates of the aq. metalworking fluid and acid titrant and the known acid concn. of the titrant, or may be detd. from calibration curves of vol. of titrant vs. known metalworking fluid concn.

LM4 ANSWER 41 OF 146 CA COPYRIGHT 2003 ACS  
AN 120:22612 CA  
TI Volumetric triangle-programmed flow titrations based on precisely generated concentration gradients  
AU Fuhrmann, B.; Spohn, U.  
CS Institut fuer Biotechnologie, Martin-Luther Universitaet Halle-Wittenberg,  
Weinbergweg 16a, 06120, Halle, Germany  
SO Analytica Chimica Acta (1993), 282(2), 397-406  
AB Linear concn. gradients were generated by means of computer-controlled micropumps to implement triangle-programmed flow titrns. Precise detns. could be performed under defined conditions without calibration. The use of inverse flow-rate gradients enables volumetric titrns. to be performed in constantly flowing streams. The mixing of flow-rate gradients of the titrn. reagent and the sample soln., which are inverse to each other, opens up a way to titrate samples with concns. varying over several orders of magnitude. The zone sampling out of precisely defined triangle concn. profiles and the injection into a continuously streaming sample or std.

soln. opens up a way to methods of flow-injection anal. (FIA) with improved reliability and online calibration. The titrns. and the FIA procedures are controlled and analyzed automatically by a personal computer. A compact and fully automated flow titrator was developed.

L14 ANSWER 44 OF 146 CA COPYRIGHT 2003 ACS  
AN 118:204339 CA

TI Oscillographic differential voltammetric titration  
AU Zhu, Junjie; Zheng, Jianbin; Bi, Shuping; Gao, Hong  
CS Dep. Chem., Nanjing Univ., Nanjing, 210008, Peop. Rep. China  
SO Fenxi Huaxue (1993), 21(1), 79-82  
LA Chinese

AB A new method, oscillog. differential voltammetric titrn., is presented. The set-up for oscillog. voltammetric titrn. was modified by adding a pos.-neg. feedback for the differential technique. Zn<sup>2+</sup>, Cd<sup>2+</sup>, Ga<sup>3+</sup>, Ni<sup>2+</sup>, and Co<sup>2+</sup> were directly titrated with EDTA or EGTA by the proposed method. The exptl. result shows that sensitivity and accuracy of the method are better than those by oscillog. voltammetric titrn.

L14 ANSWER 47 OF 146 CA COPYRIGHT 2003 ACS  
AN 118:32256 CA

TI Automated continuous-flow titration  
AU Bartroli, Jordi; Alerm, Llorenc  
CS Fac. Cienc., Univ. Auton. Barcelona, Bellaterra, 08193, Spain  
SO Analytica Chimica Acta (1992), 269(1), 29-34

AB An automated continuous titrn. method is described in which the use of a piston buret as a variable-vol. injection device in a flow system allows a continuous-flow titrn. of a sample soln. to be performed similarly to classical batch titrimetric procedures. It is found that by plotting the peak height for each injection vs. the titrant vol. injected, a titrn. curve very similar to a batch titrimetric curve can be obtained, and an equivalence vol. can be precisely detd. A linear relationship between the logarithm of the equivalence vol. and the logarithm of the carrier concn. has been obsd. over a wide concn. range. The use of reagent is kept to a min. because titrns. are performed by addn. only microliters of reagent. The time required for the titrn. is comparable to the time consumed by a process titrn. system.

L14 ANSWER 50 OF 146 CA COPYRIGHT 2003 ACS  
AN 117:123625 CA

TI Automatic titrations in unsegmented flow systems based on variable flow-rate patterns. Part 2. Complexometric and redox titrations  
AU Marcos, J.; Rios, A.; Valcarcel, M.  
CS Fac. Sci., Univ. Cordoba, Cordoba, E-14004, Spain  
SO Analytica Chimica Acta (1992), 261(1-2), 495-503  
AB Variable flow-rate patterns were used to develop automatic complexometric and redox titrn. procedures in unsegmented continuous-flow systems. Complexometric titrns. were carried out by using EDTA as titrant and were applied to single and simultaneous detns. of several metal ions with colored indicators (spectrophotometric monitoring). Ascorbic acid was also detd. by this procedure using N-bromosuccinimide as titrant and iodine-starch as indicator. The methods thus developed were applied to the anal. of real samples.

■L14 ANSWER 51 OF 146 CA COPYRIGHT 2003 ACS  
AN 117:82610 CA

TI Automatic titrations in unsegmented flow systems based on variable flow-rate patterns. Part 1. Principles and applications to acid-base

**titrations**

AU Marcos, J.; Rios, A.; Valcarcel, M.  
CS Fac. Sci., Univ. Cordoba, Cordoba, E-14004, Spain  
SO Analytica Chimica Acta (1992), 261(1-2), 489-94  
AB Automatic acid-base titrns. were carried out by generating pH gradients in a continuous-flow manifold. A programmable, computer-controlled pump was used to produce variable, reproducible flow-rate patterns that were used to increase gradually the titrant concn. in the flow system. A colorimetric indicator reagent allowed the spectrophotometric detection of the equivalence point. Strong and weak acids, both alone and in mixts., and two protons of the same acid were titrated with a relative std. deviation of 1.8%. The procedure was applied to the anal. of various real samples.

L14 ANSWER 52 OF 146 CA COPYRIGHT 2003 ACS

AN 117:7176 CA

TI An MS-DOS microcomputer controlled titration system

AU Stangeland, Leiv Jonn; Anjo, Dennis M.

CS Telemark Ingenierhoegsk., Porsgrunn, 3900, Norway

SO Journal of Chemical Education (1992), 69(4), 296-9

AB An expt. in computer interfacing, motion control, and feedback control is illustrated by using an MS-DOS microcomputer-controlled titrn. system. System hardware, software, and data input are described and the titrn. of a 5.00 mL sample of  $4.82 \times 10^{-2}$ M HCl with 0.100M NaOH used as an example. A safety note is given with regard to the system's power supply.

L14 ANSWER 53 OF 146 CA COPYRIGHT 2003 ACS

AN 116:165242 CA

TI Flow-injection coulometric titrations

AU Taylor, Richard H.; Ruzicka, Jaromir; Christian, Gary D.

CS Cent. Process Anal. Chem., Univ. Washington, Seattle, WA, 98195, USA

SO Talanta (1992), 39(3), 285-92

AB A flow-injection anal. technique based on stop flow coulometric titrns. is described, utilizing a gradient chamber, reagent generation chamber, and detector flow cell integrated into a single unit. The use of stop flow allowed for automated sample diln. up to a factor of 100 times. The system has been used to titrate samples of sodium hydroxide in the range  $5 \times 10^{-4}$ -4M, and nitric acid ranging from  $5 \times 10^{-3}$ -15M. Analyses over the entire range of concns. yielded a relative std. deviation of less than 3%. A correlation coeff. of 0.999 was obtained for all comparisons with manual titrns. Remote spectrophotometric detection was performed with optical fibers. No frit or membrane is required to sep. the generating and counter electrodes within the system, yet the advantages of conventional coulometric titrn., which eliminate the problems of reagent and calibration soln. handling, storage or degrdn., are retained.

L14 ANSWER 56 OF 146 CA COPYRIGHT 2003 ACS

AN 115:40853 CA

TI Self-indicating flow visible spectrophotometric titrations in a variable-volume tank reactor

AU Powell, Francis F.; Fogg, Arnold G.

CS Sch. Food and Fish. Stud., Humberside Polytech., Grimsby, DN34 5BQ, UK

SO Analyst (Cambridge, United Kingdom) (1991), 116(6), 631-40

AB Spectrophotometric titrns. were carried out in an emptying tank stirred reactor, in which linear concn. gradients were produced. These gradients were utilized to titrate the analyte within the tank by means of a titrant delivered by pump flow: spectrophotometric detection was made in the exit stream. Self-indicating titrns., in which changes in the absorbance of the analyte, titrant or reaction product were monitored, were performed and

found to conform to the theor. prediction. Owing to the external detection system employed, dispersion and transportation lag effects were obsd., and these were accounted for theor. The precision of the titrns. was affected was affected by the precision of the flow rates employed. The relative errors were between 1 and 2% using peristaltic pumps. The titrns. studied were iron(III) salicylate with ethylenediametetraacetic acid, iron(II) with permanganate, iron(III) with thiocyanate, and 2,4-dinitrophenol with hydroxide. These linear concn. **gradient titrns.**, in which the absorbance of the product is monitored, fulfil the conditions of the continuous variations or Job's method for detg. the stoichiometry of complexes, and are a means of **automating** the procedure.

L14 ANSWER 57 OF 146 CA COPYRIGHT 2003 ACS  
AN 114:135376 CA  
TI Continuous flow determination of colloidal charges in titration  
IN Igarashi, Chiaki  
PA Ebara-Infilco Co., Ltd., Japan; Ebara Sogo Kenkyusho K. K.  
SO Jpn. Kokai Tokkyo Koho, 5 pp.  
PI JP 01116448 A2 19890509 JP 1987-273551 19871030  
PRAI JP 1987-273551 19871030  
AB The title method involves the following: (1) providing a sample-observation component, a component for mixing a **titrating** agent, and a component for observing the state of mixing to a sample path in the **flow** direction; (2) **controlling** the **flow** rates of the sample and/or **titrating** agent to define the **titrn.** end point from the state in the mixing component and to give the end point at the mixing-observation component; and (3) detg. the amt. of the changes from the **flow** amts. of the **titrating** agent and sample. The method is useful in quant. anal. of polymers and wastewater.

DJ4 ANSWER 65 OF 146 CA COPYRIGHT 2003 ACS  
AN 108:123425 CA  
TI Exploitation of gradient techniques in flow injection analysis  
AU Hansen, Elo Harald  
CS Chem. Dep. A., Tech. Univ. Denmark, Lyngby, DK-2800, Den.  
SO Fresenius' Zeitschrift fuer Analytische Chemie (1988), 329(6), 656-9  
AB Founded on the key role of dispersion, **controlled** in space and time, the flow-injection anal. gradient techniques are based on the feasibility and selecting reproducibly suitable sections of the time/concn. matrix represented by the dispersed sample zone and exploiting the specific concns. at these points for anal. purposes. The characteristics and common these of these gradient procedures- comprising gradient diln. and calibration stopped flow reaction rate measurement, **titrns.**, **gradient** scanning and systems assocd. with simultaneous injection of 2 zones which completely or partially overlap thereby permitting the execution of selectively studies and std. addn. procedures - are briefly reviewed. Sixteen refs.

L14 ANSWER 70 OF 146 CA COPYRIGHT 2003 ACS  
AN 104:198939 CA  
TI Continuous flow two-point titration system for chloride using a pair of silver/sulfide ion selective electrodes  
AU Hara, Hirokazu; Wakizaka, Yoshiki; Okazaki, Satoshi  
CS Fac. Educ., Shiga Univ., Otsu, 520, Japan  
SO Analytical Chemistry (1986), 58(7), 1502-6  
AB A microcomputer-aided **flow titrn.** system was designed for the continuous detn. of Cl<sup>-</sup> in the concn. range 2-18 mg L<sup>-1</sup>. The significant feature of the system is that the **titrn.** process is realized continuously by utilizing the 2-point **titrn.** principle, in which the addn. of a small excess of

titrant ( $\text{AgNO}_3$ ) is followed by the 2nd addn. in a **flow** stream. The concn. of  $\text{Cl}^-$  can be estd. continuously from the p.d. between a pair of  $\text{Ag}/\text{S}_2^-$ -electrodes. Accuracy was within 2%, and the precision of 5 successive measurements was within 0.9% for 6-14 mg L<sup>-1</sup> std.  $\text{Cl}^-$  soln. Anal. of river water samples contg. 9.6-16.9 mg L<sup>-1</sup>  $\text{Cl}^-$  showed a max. error of 1.8% compared with the results of batchwise titrimetric detn. This system was applied to a continuous detn. of  $\text{Cl}^-$  in river water.

L14 ANSWER 81 OF 146 CA COPYRIGHT 2003 ACS  
AN 95:222097 CA  
TI Characterized **feedback** and feedforward pH control  
AU Gray, David M.  
CS Leeds and Northrup Co., North Wales, PA, 19454, USA  
SO ISA Transactions (1981), 20(2), 63-6  
AB Instrumentation combining **feedback** or feedforward pH signals with process flowrate is described. Characterization of pH based on av. process **titrn.** data provides a linearized reagent demand signal for control. Advantages and limitations of **feedback** and feedforward control are compared in evaluating their abilities to reduce the costs of tankage and mixing in industrial neutralization systems.

L14 ANSWER 87 OF 146 CA COPYRIGHT 2003 ACS  
AN 92:208309 CA  
TI Controlled dynamic titrator  
AU Abicht, S. M.  
CS Fachricht. Org. Instrum. Anal., Univ. Saarlandes, Saarbruecken, D-6600, Fed. Rep. Ger.  
SO Analytica Chimica Acta (1980), 114, 247-56  
AB The **controlled** dynamic **titrator** operates with const. titrant **flow** and time-proportional sample **flow**; sample and titrant are mixed in a microcell and the equivalence point is reached when the products of the normalities and **flow** rates of the titrant and the sample are equal. **Titrn.** times are measured and printed out. The concn. of the sample is inversely proportional to the **titrn.** time. The **automatic titrator** is discontinuous and suitable for on-line and off-line use. The cycle time of the motor-driven programmer is 2 min. **Flow**-through detectors for potentiometric, photometric, or voltammetric indication can be used for a selection of acid-base and redox **titrns.** With this equipment, **titrn.** of large series of liq. samples with similar contents is simple.

L14 ANSWER 90 OF 146 CA COPYRIGHT 2003 ACS  
AN 89:208587 CA  
TI Titrimetry in a continuous **flow** system. I. Apparatus and determination of sulfate  
AU Reijnders, H. F. R.; Van Staden, J. J.; Eelderink, G. H. B.; Griepink, B.  
CS Natl. Inst. Public Health, Bilthoven, Neth.  
SO Fresenius' Zeitschrift fuer Analytische Chemie (1978), 292(4), 290-2  
AB  $\text{SO}_4^{2-}$  in the range of 5-2000  $\mu\text{mol/L}$  was detd. by **automatic titrn.** with  $\text{Ba}(\text{II})$  in a device with an optical detection system which is able to correct **automatically** for diln. and turbidity. The **flow**-through system contains 80 vol.% EtOH; the indicator was Dimethylsulfonazo III. Above a concn. level of ~20  $\mu\text{mol SO}_4^{2-}/\text{L}$  the std. deviation is <5% relative. The **titrn.** time is negligibly small as compared to the sampling time.

L14 ANSWER 92 OF 146 CA COPYRIGHT 2003 ACS  
AN 88:114619 CA  
TI Flow injection analysis. Part IX. A new approach to **continuous flow titrations**

AU Ruzicka, J.; Hansen, E. H.; Mosbaek, H.  
CS Chem. Dep. A, Tech. Univ. Denmark, Lyngby, Den.  
SO Analytica Chimica Acta (1977), 92(2), 235-49  
AB Studies of dispersion patterns in nonsegmented streams flowing through narrow open tubes show that it is possible to obtain highly reproducible concn. gradients within a sample zone injected into the moving stream. By varying the geometry of the flow path, low, medium, and high dispersion patterns can be achieved; the high dispersion pattern forms the basis for a new approach to continuous-flow titrimetry. In this type of titrn., discrete samples are passed through a gradient device and are then mixed with a continuously flowing stream of titrant of fixed concn. The new technique was tested for potentiometric as well as spectrophotometric end-point indication. A simple 1-channel system allows titrns. to be performed automatically in <1 min.

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AN 88:15398 CA  
TI A novel titration technique for the analysis of streamed samples - the triangle-programmed titration technique. Part I. General considerations  
AU Nagy, G.; Feher, Z.; Toth, K.; Pungor, E.  
CS E. Gy. T. Pharmacochem. Works, Budapest, Hung.  
SO Analytica Chimica Acta (1977), 91(2), 87-96  
AB The principle of a novel continuous titrn. technique with triangle-programmed reagent addn. is described. The titrn. reagent is increased beyond the equivalence point and then decreased back through the equivalence point to provide the recording of 2 equivalence points per detn. The high precision and reliability of titrn. techniques are combined with the convenience and fast sample handling of mechanized analyzers of the flow-through type. The theor. titrn. curves are discussed for detectors with logarithmic and linear signal conversion characteristics.

LX4 ANSWER 97 OF 146 CA COPYRIGHT 2003 ACS

AN 87:77931 CA  
TI Apparatus and method for continuous titration of a liquid  
IN Van Osch, Gerardus Wouter Serge; Weelink, Antonius M. H.; Dornseiffen, Lucas Willem  
PA Control Data Corp., USA  
SO Ger. Offen., 13 pp.  
PI DE 2642859 A1 19770414 DE 1976-2642859 19760923  
PRAI NL 1975-11923 19751010  
AB An app. for continuous titrn. of liqs. is described in which the titrated liq. is introduced continuously into a titrn. chamber to which the titrant is added by using a pump. The analyte concn. is detd. potentiometrically by using an ion-selective electrode and a ref. electrode. The potential of the ion-selective electrode controls the flow rate of the titrant and the equivalence point is reached automatically.

LX4 ANSWER 100 OF 146 CA COPYRIGHT 2003 ACS

AN 83:128341 CA  
TI Gradient titration apparatus for determining spectrophotometric binding isotherms  
AU Walz, Frederick G., Jr.  
CS Dep. Biol. Sci., State Univ. New York, Albany, NY, USA  
SO Analytical Biochemistry (1975), 67(2), 446-52  
AB On automatic gradient titrn. app. was constructed by using a multi-channel peristaltic pump and a recording spectrometer with a flow cell. The ability of the app. to repetitively generate continuous spectrometric binding isotherms was tested by studying the complex formed by the binding

of DNA with neutral red (pH=7.44 and 7.33; absorbance=550 nm). The binding curves obtained with the app. were analyzed by calcn. and comparison with curves obtained by a manual method (Walz, F. G., Jr., et al., 1975). The app. was used also to det. binding stoichiometries by automatically performing the method of continuous variations by using the interaction of calmagite with Mg<sup>2+</sup> (pH 10.1, absorbance=610 nm). Low vols. of reactants were required (4-8 ml), and complete binding curves were obtained in <15 min.

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